P19-10017

NASA News

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For Release:

TUESDAY,
February 20, 1979

RELEASE NO: 79-17

WORLDWIDE WEATHER STUDY MAJOR COOPERATIVE EFFORT

Thousands of scientists from around the world are taking part in the Global Weather Experiment, the largest international scientific experiment ever conducted.

The latest phase of the experiment, which began in January, is trying to find the practical limits of weather forecasting and design a world weather observation system to operate within these limits.

The National Aeronautics and Space Administration's Goddard Space Flight Center in Greenbelt, Md., is a key participant in the 11-month effort.

A massive array of scientific personnel and observation equipment will monitor the Earth's oceans and atmosphere to compile worldwide weather data.

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February 12, 1979

The experiment is part of the Global Atmospheric Research Program (GARP), a joint effort of the 147-member-nation World Meteorological Organization (WMO) and the International Council of Scientific Unions. There will be 70 countries and five international organizations contributing directly to the project. The cooperative efforts began in 1974 with the GARP Atlantic Tropical Experiment, when the Earth's tropical belt from Mexico to East Africa was surveyed.

United States participants include the Departments of Commerce, Defense, Energy, Interior, Transportation and State; NASA; the National Center for Atmospheric Research; the National Science Foundation; the Defense Nuclear Agency; the Air Force, Army, Navy and Coast Guard; and many academic institutions. Scientific advice for the program and liaison with the international scientific community are provided by the National Academy of Sciences. U.S. participation is coordinated by the National Oceanic and Atmospheric Administration (NOAA).

The scope of the operation is vast.

The existing World Weather Watch, which generates upwards of 40,000 observations daily, is being supplemented by 10 space satellites, some 50 research vessels, 110 aircraft (including 10 research planes), 300 high-altitude balloons and 300 instrumented drifting buoys.

New generation satellites are playing a central role in the experiment. Five satellites in geosynchronous orbit, three from the U.S. (Geostationary Operational Environmental Satellite--GOES), one from Japan (Geostationary Meteorological Satellite--GMS), and one from the European Space Agency (Meteosat), are hovering 36,000 kilometers (22,300 miles) above the equator. The polar-orbiting Tiros-N is a primary source of data, and NOAA-A -- scheduled for launch in April -- will be an added contributor. Two polar-orbiting satellites from the U.S.S.R. also will participate. All spacecraft will be monitoring winds (from cloud images), atmospheric temperature and humidity. The polar-orbiting Nimbus-7 supplies additional information on such factors as ocean rainfall and sea surface temperatures.

Focus of the NASA studies is on application of satellite data to forecasting and the design of meteorological space systems for the future. The research is being done at Goddard's Laboratory for Atmospheric Sciences through its GARP project, which is managed by James R. Greaves.

Total cost of the 10-year program to the U.S. is $90 million, which includes all funding for all U.S. agencies involved from 1974 to 1984. NASA's share of that cost is $25 million.

One area to be scrutinized in the research is the broad belt around the equator, the enormous heat sink that absorbs much of the Sun's energy and generates much of the world's weather. To get more data on this crucial region, a number of systems are being operated during two special observing periods -- Jan. 5 to March 5 and May 1 to June 30 when vital information on tropical winds will be gathered.

Some 50 ships (mainly oceanographic research vessels) from 22 nations will twice daily release balloon-borne instrument packages called "radiosondes."

Ten U.S. Air Force and NOAA aircraft will fly daily sorties, dropping wind-measuring instruments over the equatorial Atlantic, the central and eastern Pacific and the Indian Ocean. U.S. researchers will launch 150 constant-level balloons from Ascension Island in the Atlantic and Canton Island in the Pacific to monitor winds at 14,000 meters (45,000 feet).

Virtually no weather observations now come from the lonely ocean expanses of the southern hemisphere. The U.S. polar-orbiting satellites help fill this data void. But to get more detailed measurements, some 300 instrumented buoys (from eight nations) have been deployed over an area 20 to 60 degrees south latitude. These drifting buoys provide sea-surface temperatures and atmospheric pressure measurements.

During 1979, 20 specially-equipped, wide-bodied commercial jets on international routes will automatically transmit wind, temperature and pressure data to satellite receivers. Another 80 or so commercial jets will be supplying this same sort of information on a delayed basis.

All these systems will generate weather data for the 85 per cent of the Earth's area not now covered by the World Weather Watch. Because weather in the equatorial belt and the southern hemisphere has a powerful influence on conditions to the north, such information is necessary for extended forecasting.

Once the Global Weather Experiment ends on Nov. 30, 1979, the mass of data first will be processed by centers in a number of nations and then forwarded to World Data Centers in Moscow and Washington, D.C. and to meteorological research laboratories in Bracknell, England, and Princeton, N.J. There scientists will use giant computers to refine the data and for the first time construct a complete 12-month world weather history. Researchers then will be able to run computer experiments that use this unique record to test results.

The outcome of these experiments should enable scientists to determine not only the ultimate limits of weather prediction, but also what weather data are necessary to reach those limits, and what kind of global observing system is needed to gather such data.

Probably answers will take several years but the results could be far-reaching. The potential socio-economic impact of improved extended weather forecasts could be dramatic. Many industries -- construction, agriculture, transportation, energy, and others -- would benefit enormously from a better knowledge of what the weather would be a week or two in advance.

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